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SpaceX

Space Exploration Technologies Corp., commonly referred to as **SpaceX**, is an American space technology company headquartered at the Starbase development site near Brownsville, Texas. Since its founding in 2002, the company has made numerous advancements in rocket propulsion, reusable launch vehicles, human spaceflight and satellite constellation technology. As of 2024, SpaceX is the world's dominant space launch provider, its launch cadence eclipsing all others, including private competitors and national programs like the Chinese space program.[8] SpaceX, NASA, and the United States Armed Forces work closely together by means of governmental contracts.[9]

SpaceX was founded by Elon Musk in 2002 with a vision of decreasing the costs of space launches, paving the way to a sustainable colony on Mars. In 2008, when SpaceX was almost bankrupt, Falcon 1 successfully launched into orbit after three failed launch attempts. The company then pivoted towards the development of the larger Falcon 9 rocket and the Dragon 1 capsule to satisfy NASA's COTS contracts for deliveries to the International Space Station. By 2012, SpaceX finished all COTS test flights and began delivering Commercial Resupply Services missions to the International Space Station. Also around that time, SpaceX started developing hardware to make the Falcon 9 first stage reusable. The company demonstrated the first successful first-stage landing in 2015 and re-launch of the first stage in 2017. Falcon Heavy, built from three Falcon 9 boosters, first flew in 2018 after a more than decade-long development process. As of October 2024, the company's Falcon 9 rockets have landed and flown again more than 330 times, reaching 1–2 launches a week.

These milestones delivered the company much-needed investment and SpaceX sought to diversify its sources of income. In 2019, the first operational satellite of the Starlink internet satellite constellation came online. In

Space Exploration Technologies Corp.

Company headquarters, SpaceX Starbase near Brownsville, Texas

Trade name	SpaceX
Company type	Private
Industry	Space Telecommunications
Founded	March 14, 2002 in El Segundo, California, U.S.[1]
Founder	Elon Musk
Headquarters	SpaceX Starbase, Cameron County, Texas, United States
Key people	Elon Musk (CEO, Chair & CTO)[2] Gwynne Shotwell (President & COO)[3]
Products	Launch vehicles Dragon capsules Starshield
Revenue	▲ US$4.6 billion (2022)[4]
Net income	▲ US$−559 million (2022)[4]
Owner	Elon Musk (42% equity; 79% voting control)[5]
Number of employees	13,000+[6] (September 2023)

Subsidiaries	Starlink[7] Swarm Technologies Pioneer Aerospace
Website	spacex.com (https://www.spacex.com/)

subsequent years, Starlink generated the bulk of SpaceX's income and paved the way for its Starshield military counterpart. In 2020, SpaceX began to operate its Dragon 2 capsules to deliver crewed missions for NASA and private entities. Around this time, SpaceX began building test prototypes for Starship, which is the largest launch vehicle in history and aims to fully realize the company's vision of a fully-reusable, cost-effective and adaptable launch vehicle. SpaceX is also developing its own space suit and astronaut via its Polaris program[10] as well as developing the human lander for lunar missions under NASA's Artemis program.[11] SpaceX is not publicly traded; a space industry newspaper estimated that SpaceX has a revenue of over $10 billion in 2024.[12]

History

2001–2004: Founding

In early 2001, Elon Musk met Robert Zubrin and donated $100,000 to his Mars Society, joining its board of directors for a short time.[13]:30–31 He gave a plenary talk at their fourth convention where he announced *Mars Oasis*, a project to land a greenhouse and grow plants on Mars.[14][15] Musk initially attempted to acquire a Dnepr launch vehicle for the project through Russian contacts from Jim Cantrell.[16]

Musk returned with his team to Moscow, this time bringing Michael Griffin, who later became the 11th Administrator of NASA, but found the Russians increasingly unreceptive.[17][18] On the flight home, Musk announced he could start a company to build the affordable rockets they needed instead.[18] By applying vertical integration,[17] using inexpensive commercial off-the-shelf components when possible,[18] and adopting the modular approach of modern software engineering, Musk believed SpaceX could significantly cut launch costs.[18]

In early 2002, Elon Musk started to look for staff for his company, soon to be named SpaceX. Musk approached five people for the initial positions at the fledgling company, including Griffin, who declined the position of Chief Engineer,[19]:11 Jim Cantrell and John Garvey (Cantrell and Garvey would later found the company Vector Launch), rocket engineer Tom Mueller, and Chris Thompson.[19][20] SpaceX was first headquartered in a warehouse in El Segundo, California. Early SpaceX employees, such as Tom Mueller (CTO), Gwynne Shotwell (COO), and Chris Thompson (VP of Operations), came from neighboring TRW and Boeing corporations. By November 2005, the company had 160 employees.[21] Musk personally interviewed and approved all of SpaceX's early employees.[19]:22

Musk has stated that one of his goals with SpaceX is to decrease the cost and improve the reliability of access to space, ultimately by a factor of ten.[22]

2005–2009: Falcon 1 and first orbital launches

SpaceX developed its first orbital launch vehicle, the Falcon 1, with internal funding.[23][24] The Falcon 1 was an expendable two-stage-to-orbit small-lift launch vehicle. The total development cost of Falcon 1 was approximately $90 million[25] to $100 million.[19]:215

The Falcon rocket series was named after *Star Wars*'s *Millennium Falcon* fictional spacecraft.[26]

The first successful Falcon 1 launch in September 2008

In 2004, SpaceX protested against NASA to the Government Accountability Office (GAO) because of a sole-source contract awarded to Kistler Aerospace. Before the GAO could respond, NASA withdrew the contract, and formed the COTS program.[19]:109–110[27] In 2005, SpaceX announced plans to pursue a human-rated commercial space program through the end of the decade, a program that would later become the Dragon spacecraft.[28] In 2006, the company was selected by NASA and awarded $396 million to provide crew and cargo resupply demonstration contracts to the International Space Station (ISS) under the COTS program.[29]

The first two Falcon 1 launches were purchased by the United States Department of Defense under the DARPA Falcon Project which evaluated new U.S. launch vehicles suitable for use in hypersonic missile delivery for Prompt Global Strike.[24][30][31] The first three launches of the rocket, between 2006 and 2008, all resulted in failures, which almost ended the company. Financing for Tesla Motors had failed, as well,[32] and consequently Tesla, SolarCity, and Musk personally were all nearly bankrupt at the same time.[19]:178–182 Musk was reportedly "waking from nightmares, screaming and in physical pain" because of the stress.[19]:216

The financial situation started to turn around with the first successful launch achieved on the fourth attempt on 28 September 2008. Musk split his remaining $30 million between SpaceX and Tesla, and NASA awarded the first Commercial Resupply Services (CRS) contract awarding $1.6 billion to SpaceX in December, thus financially saving the company.[19]:217–221 Based on these factors and the further business operations they enabled, the Falcon 1 was soon retired following its second successful, and fifth total, launch in July 2009. This allowed SpaceX to focus company resources on the development of a larger orbital rocket, the Falcon 9.[33] Gwynne Shotwell was also promoted to company president at the time, for her role in successfully negotiating the CRS contract with the NASA Associate Administrator Bill Gerstenmaier.[34][19]:222

2010–2012: Falcon 9, Dragon, and NASA contracts

Video of the first launch of Falcon 9

SpaceX originally intended to follow its light Falcon 1 launch vehicle with an intermediate capacity vehicle, the Falcon 5.[35] The company instead decided in 2005 to proceed with the development of the Falcon 9, a reusable heavier lift vehicle. Development of the Falcon 9 was accelerated by NASA, which committed to purchasing several commercial flights if specific capabilities were demonstrated. This started with seed money from the Commercial Orbital Transportation Services (COTS) program in 2006.[36] The overall contract award was $278 million to provide development funding for the Dragon spacecraft, Falcon 9, and demonstration launches of Falcon 9 with Dragon.[36] As part of this contract, the Falcon 9 launched for the first time in June 2010 with the Dragon Spacecraft Qualification Unit, using a mockup of the Dragon spacecraft.

The first operational Dragon spacecraft was launched in December 2010 aboard COTS Demo Flight 1, the Falcon 9's second flight, and safely returned to Earth after two orbits, completing all its mission objectives.[37] By December 2010, the SpaceX production line was manufacturing one Falcon 9 and Dragon every three months.[38]

In April 2011, as part of its second-round Commercial Crew Development (CCDev) program, NASA issued a $75 million contract for SpaceX to develop an integrated launch escape system for Dragon in preparation for human-rating it as a crew transport vehicle to the ISS.[39] NASA awarded SpaceX a fixed-price Space Act Agreement (SAA) to produce a detailed design of the crew transportation system in August 2012.[40]

In early 2012, approximately two-thirds of SpaceX stock was owned by Musk[41] and his seventy million shares were then estimated to be worth $875 million on private markets,[42] valuing SpaceX at $1.3 billion.[43] In May 2012, with the Dragon C2+ launch, Dragon became the first commercial spacecraft to deliver cargo to the International Space Station.[44] After the flight, the company private equity valuation nearly doubled to $2.4 billion or $20/share.[45][46] By that time, SpaceX had operated on total funding of approximately $1 billion over its first decade of operation. Of this, private equity provided approximately $200 million, with Musk investing approximately $100 million and other investors having put in about $100 million.[47]

SpaceX's active reusability test program began in late 2012 with testing low-altitude, low-speed aspects of the landing technology.[48] The Falcon 9 prototypes performed vertical takeoffs and landings (VTOL). High-velocity, high-altitude tests of the booster atmospheric return technology began in late 2013.[48]

2013–2015: Commercial launches and rapid growth

SpaceX launched the first commercial mission for a private customer in 2013. In 2014, SpaceX won nine contracts out of the 20 that were openly competed worldwide.[49] That year Arianespace requested that European governments provide additional subsidies to face the competition from SpaceX.[50][51] Beginning in 2014, SpaceX capabilities and pricing also began to affect the market for launch of U.S. military payloads, which for nearly a decade had been dominated by the large U.S. launch provider United Launch Alliance (ULA).[52] The monopoly had allowed launch costs by the U.S. provider to rise to over $400 million over the years.[53] In September 2014, NASA's Director of Commercial Spaceflight, Kevin Crigler, awarded SpaceX the Commercial Crew Transportation Capability (CCtCap) contract to finalize the development of the Crew Transportation System. The contract included several technical and certification milestones, an uncrewed flight test, a crewed flight test, and six operational missions after certification.[40]

Launch of Falcon 9 carrying ORBCOMM OG2-M1, July 2014

In January 2015, SpaceX raised $1 billion in funding from Google and Fidelity Investments, in exchange for 8.33% of the company, establishing the company valuation at approximately $12 billion.[54] The same month SpaceX announced the development of a new satellite constellation, called Starlink, to provide global broadband internet service with 4,000 satellites.[55]

The Falcon 9 had its first major failure in late June 2015, when the seventh ISS resupply mission, CRS-7 exploded two minutes into the flight. The problem was traced to a failed two-foot-long steel strut that held a helium pressure vessel, which broke free due to the force of acceleration. This caused a breach and allowed high-pressure helium to escape into the low-pressure propellant tank, causing the failure.[56]

2015–2017: Reusability milestones

SpaceX first achieved a successful landing and recovery of a first stage in December 2015 with Falcon 9 Flight 20.[57] In April 2016, the company achieved the first successful landing on the autonomous spaceport drone ship (ASDS) *Of Course I Still Love You* in the Atlantic Ocean.[58] By October 2016, following the successful landings, SpaceX indicated they were offering their customers a 10% price discount if they choose to fly their payload on a reused Falcon 9 first stage.[59]

Falcon 9 first stage on an autonomous spaceport drone ship (ASDS) barge after the first successful landing at sea, SpaceX CRS-8 mission

A second major rocket failure happened in early September 2016, when a Falcon 9 exploded during a propellant fill operation for a standard pre-launch static fire test. The payload, the AMOS-6 communications satellite valued at $200 million, was destroyed.[60] The explosion was caused by the liquid oxygen that is used as propellant turning so cold that it solidified and ignited with carbon composite helium vessels.[61] Though not considered an unsuccessful flight, the rocket explosion sent the company into a four-month launch hiatus while it worked out what went wrong. SpaceX returned to flight in January 2017.[62]

In March 2017, SpaceX launched a returned Falcon 9 for the SES-10 satellite. This was the first time a re-launch of a payload-carrying orbital rocket went back to space.[63] The first stage was recovered again, also making it the first landing of a reused orbital class rocket.[64]

2017–2018: Leading global commercial launch provider

In July 2017, the company raised $350 million, which raised its valuation to $21 billion.[65] In 2017, SpaceX achieved a 45% global market share for awarded commercial launch contracts.[66] By March 2018, SpaceX had more than 100 launches on its manifest representing about $12 billion in contract revenue.[67] The contracts included both commercial and government (NASA/DOD) customers.[68] This made SpaceX the leading global commercial launch provider measured by manifested launches.[69]

In 2017, SpaceX formed a subsidiary, The Boring Company,[70] and began work to construct a short test tunnel on and adjacent to the SpaceX headquarters and manufacturing facility, using a small number of SpaceX employees,[71] which was completed in May 2018,[72] and opened to the public in December 2018.[73] During 2018, The Boring Company was spun out into a separate corporate entity with 6% of the equity going to SpaceX, less than 10% to early employees, and the remainder of the equity to Elon Musk.[73]

Since 2019: Starship, first crewed launches, Starlink and general

In 2019 SpaceX raised $1.33 billion of capital across three funding rounds.[74] By May 2019, the valuation of SpaceX had risen to $33.3 billion[75] and reached $36 billion by March 2020.[76]

On 19 August 2020, after a $1.9 billion funding round, one of the largest single fundraising pushes by any privately held company, SpaceX's valuation increased to $46 billion.[77][78][79]

In February 2021, SpaceX raised an additional $1.61 billion in an equity round from 99 investors[80] at a per share value of approximately $420,[79] raising the company valuation to approximately $74 billion. By 2021, SpaceX had raised more than $6 billion in equity financing. Most of the capital raised since 2019 has been used to support the operational fielding of the Starlink satellite constellation and the development and manufacture of the Starship launch vehicle.[80] By October 2021, the valuation of SpaceX had risen to $100.3 billion.[81] On 16 April 2021, Starship HLS won a contract to play a critical role in the NASA crewed spaceflight Artemis program.[82] By 2021, SpaceX had entered into agreements with Google Cloud Platform and Microsoft Azure to provide on-ground computer and networking services for Starlink.[83] A new round of financing in 2022 valued SpaceX at $127 billion.[84]

In July 2021, SpaceX unveiled another drone ship named *A Shortfall of Gravitas*, landing a booster from CRS-23 on it for the first time on 29 August 2021.[85] Within the first 130 days of 2022, SpaceX had 18 rocket launches and two astronaut splashdowns. On 13 December 2021, company CEO Elon Musk announced that the company was starting a carbon dioxide removal program that would convert captured carbon into rocket fuel,[86][87] after he announced a $100 million donation to the X Prize Foundation the previous February to provide the monetary rewards to winners in a contest to develop the best carbon capture technology.[88][89]

In August 2022, Reuters reported that the European Space Agency (ESA) began initial discussions with SpaceX that could lead to the company's launchers being used temporarily, given that Russia blocked access to Soyuz rockets amid the Russian invasion of Ukraine.[90] Since that invasion and in the greater war between Russia and Ukraine, Starlink was extensively used.[91]

In 2022, SpaceX's Falcon 9 also became the world record holder for the most launches of a single vehicle type in a single year.[92][93] SpaceX launched a rocket approximately every six days in 2022, with 61 launches in total. All but one (a Falcon Heavy in November) was on a Falcon 9 rocket.[92]

In November 2023, SpaceX announced it would acquire its parachute supplier Pioneer Aerospace out of bankruptcy for $2.2 million.[94][95]

2024 headquarters move from California to Texas

On 16 July 2024, Elon Musk posted on X that SpaceX would move its headquarters from Hawthorne, California, to SpaceX Starbase in Brownsville, Texas. Musk said this was because the recently passed California AB1955 bill "and the many others that preceded it, attacking both families and companies".[96] This new law in California bans school districts from requiring that teachers notify parents about changes to a student's sexual orientation and gender identity.[97] The headquarters officially moved to Brownsville, Texas in August 2024, according to records filed with the California Secretary of State.[98]

The move to relocate SpaceX's headquarters was seen as largely symbolic, at least in the short term. The Hawthorne facility continues to support the company's Falcon launch vehicles, which was SpaceX's workhorse product in 2024.

SpaceX's Polaris Dawn mission featured the first-ever private spacewalk, marking a major milestone in commercial space exploration.[99]

Starship

In January 2019, SpaceX announced it would lay off 10% of its workforce to help finance the Starship and Starlink projects.[100] The purpose of the Starship vehicle is to enable large-scale transit of humans and cargo to the Moon, Mars, and beyond.[101] SpaceX's Starship is the largest and most powerful rocket ever flown, with a payload capacity of 100+ tons.[102][103] Construction of initial prototypes and tests for Starship started in early 2019 in Florida and Texas. All Starship construction and testing moved to the new SpaceX South Texas launch site later that year.

Starship in launch position

On 20 April 2023, Starship's first orbital flight test ended in a mid-air explosion over the Gulf of Mexico before booster separation. After launch, multiple engines in the booster progressively failed, causing the vehicle to reach max *q* later than planned. "Max q" is the theoretical point of maximal mechanical stress which occurs during the launch sequence of a space vehicle. In the case of a rocket that must be self-destructed during its ascent, max q occurs at the point of self-destruction. Eventually, the vehicle lost control and spun erratically until the automated flight termination system was activated, which intentionally destroyed the rocket. Elon Musk, SpaceX, and other individuals familiar with the space industry have referred to the test flight as a success.[104][105]

Musk said at the time that it would take "six to eight weeks" to get the infrastructure prepared for another launch. In October 2023, a senior SpaceX executive stated the company had been ready to launch the next test flight since September. He accused government regulators of disrupting the project's progress, adding the delay could lead to China beating U.S. astronauts back to the Moon.[106][107]

On 18 November 2023, SpaceX launched Starship on its second flight test, with both vehicles flying for a few minutes before separately exploding.[108][109][110][111]

In early March 2024 SpaceX announced that it was targeting 14 March as the tentative launch date for its next uncrewed Starship launch configuration flight test, pending the issuance of a "launch license" by the FAA. This license was granted on 13 March 2024.[112] On 14 March 2024 at 13:25 UTC, Starship launched for the third time and for the first time Starship reached its planned suborbital trajectory. The flight ended with the booster experiencing a malfunction shortly before landing and the ship being lost during re-entry over the Indian Ocean.[102][103]

On 4 June 2024, SpaceX received the launch license for Starship's fourth flight test. The licensure itself was notable in that it was the first time that the FAA included a clause that would allow SpaceX to launch subsequent test flights without a mishap investigation, provided that they met a similar launch profile and used the same specification of hardware. The provision could prove to speed the development timeline.[113]

On 12 October 2024, SpaceX received FAA approval for Starship's fifth flight test.[114] The flight was the first without engine failures, and the first successful tower catch.[115]

SpaceX launched Starship on its sixth flight test on 19 November 2024.[116] The booster aborted the catch attempt, while the ship conducted a relight in space.[117][118]

On 16 January 2025, SpaceX launched Starship on its seventh flight test, with the first Block 2 Ship, Ship 33 (standing at 403 ft or 123 meters). This test also carried a demonstration payload, a Starlink V3 simulator. The test launched at 22:37 UTC. The test resulted in the second catch of the Super Heavy booster, B14, but unfortunately after 8 minutes, SpaceX lost contact with 'Ship', which is the upper stage of the Starship which resulted in the failure of the ship during the ascent. The spacecraft reportedly exploded around 8.5 minutes after launch over the Atlantic Ocean near the Turks and Caicos Islands, putting on a display for the viewers to capture. The FAA, on the 18th of January, required a mishap investigation of the failure.[119]

Crewed launches

A significant milestone was achieved in May 2020, when SpaceX successfully launched two NASA astronauts (Doug Hurley and Bob Behnken) into orbit on a Crew Dragon spacecraft during Crew Dragon Demo-2, making SpaceX the first private company to send astronauts to the International Space Station and marking the first crewed orbital launch from American soil in 9 years.[120][121] The mission launched from Kennedy Space Center Launch Complex 39A (LC-39A) in Florida.[122]

NASA astronauts Douglas Hurley (left) and Robert Behnken (right) wearing custom-fit spacesuits designed by SpaceX.

Starlink

In May 2019, SpaceX launched the first large batch of 60 Starlink satellites, beginning to deploy what would become the world's largest commercial satellite constellation the following year.[123] In 2022, most SpaceX launches focused on Starlink, a consumer internet business that sends batches of internet-beaming satellites and now has over 6,000 satellites in orbit.[124]

On 16 July 2021, SpaceX entered an agreement to acquire Swarm Technologies, a private company building a low Earth orbit satellite constellation for communications with Internet of things (IoT) devices, for $524 million.[125][4]

In December 2022, the U.S. Federal Communications Commission (FCC) approved the launch of up to 7,500 of SpaceX's next-generation satellites in its Starlink internet network.[126]

Summary of achievements

Date	Achievement	Flight
28 September 2008	First privately funded, fully liquid-fueled rocket to reach orbit.[127]	Falcon 1 Flight 4
14 July 2009	First privately funded, fully liquid-fueled rocket to put a commercial satellite in orbit.	Falcon 1 Flight 5
9 December 2010	First private company to successfully launch, orbit, and recover a spacecraft.	SpaceX COTS Demo Flight 1
25 May 2012	First private company to send a spacecraft to the International Space Station (ISS).[128]	SpaceX COTS Demo Flight 2
22 December 2015	First landing of an orbital-class rocket's first stage on land.	Falcon 9 Flight 20
8 April 2016	First landing of an orbital-class rocket's first stage on an ocean platform.	SpaceX CRS-8
30 March 2017	First reuse and (second) landing of an orbital first stage.[63]	SES-10
	First controlled flyback and recovery of a payload fairing.[129]	
3 June 2017	First reuse of a commercial cargo spacecraft.[130]	SpaceX CRS-11
6 February 2018	First private spacecraft launched into heliocentric orbit.	Falcon Heavy test flight
2 March 2019	First private company to send a human-rated spacecraft to orbit.	Crew Dragon Demo-1
3 March 2019	First private company to autonomously dock a human-rated spacecraft to the ISS.	
25 July 2019	First flight of a full-flow staged combustion cycle engine (Raptor).[131]	*Starhopper*
11 November 2019	First reuse of a payload fairing.[132]	Starlink 2 v1.0
30 May 2020	First private company to send humans into orbit.[133]	Crew Dragon Demo-2
	First private company to send humans to the ISS.[134]	
24 January 2021	Most spacecraft launched on a single mission, 143 satellites.[a][135]	Transporter-1
23 April 2021	First reuse of a crewed space capsule.[136]	SpaceX Crew-2 / *Endeavour*
	First reused booster to send humans into orbit.	
17 June 2021	First reused booster to launch a 'national security' mission.[137]	GPS III-05
16 September 2021	First orbital launch of an all-private crew.[138][139]	Inspiration4
24 November 2021	Longest streak of orbital launches without a mission failure or partial failure for a single rocket type (Falcon 9, 101 launches).[140]	Double Asteroid Redirection Test
9 April 2022	First all-private crew to dock with the International Space Station.[141]	Axiom Mission 1
20 October 2022	Highest number of launches of a single rocket type in a calendar year (Falcon 9, 48 launches).[142]	Starlink 4-36
20 April 2023	Tallest, most massive, most powerful rocket to ever launch.[143][144]	SpaceX Starship orbital test flight

14 March 2024	Starship reaches intended orbital velocity for the first time.[145]	SpaceX Starship integrated flight test 3
12 April 2024	A single Falcon 9 booster reused for the 20th time.[146]	Booster 1062
12 September 2024	First commercial spacewalk	Polaris Dawn
13 October 2024	First Super Heavy booster catch	Starship flight test 5
19 November 2024	First in space relight of a full-flow staged combustion cycle engine (Raptor).[117]	Starship flight test 6

a. Excluding the passive objects launched as part of Project West Ford

Hardware

Launch vehicles

The landing of a Falcon 9 Block 5 first stage at Cape Canaveral in July 2019. VTVL technologies are used in many of SpaceX's launch vehicles.

SpaceX has developed three launch vehicles. The small-lift Falcon 1 was the first launch vehicle developed and was retired in 2009. The medium-lift Falcon 9 and the heavy-lift Falcon Heavy are both operational.

Falcon 1 was a small rocket capable of placing several hundred kilograms into low Earth orbit. It launched five times between 2006 and 2009, of which two were successful.[147] The Falcon 1 was the first privately funded, liquid-fueled rocket to reach orbit.[127]

Falcon 9 is a medium-lift launch vehicle capable of delivering up to 22,800 kilograms (50,265 lb) to orbit, competing with the Delta IV and the Atlas V rockets, as well as other launch providers around the world. It has nine Merlin engines in its first stage. The Falcon 9 v1.0 rocket successfully reached orbit on its first attempt on 4 June 2010. Its third flight, COTS Demo Flight 2, launched on 22 May 2012 and launched the first commercial spacecraft to reach and dock with the International Space Station (ISS).[44] The vehicle was upgraded to Falcon 9 v1.1 in 2013, Falcon 9 Full Thrust in 2015, and finally to Falcon 9 Block 5 in 2018. The first stage of Falcon 9 is designed to retro propulsively land, be recovered, and flown again.[148]

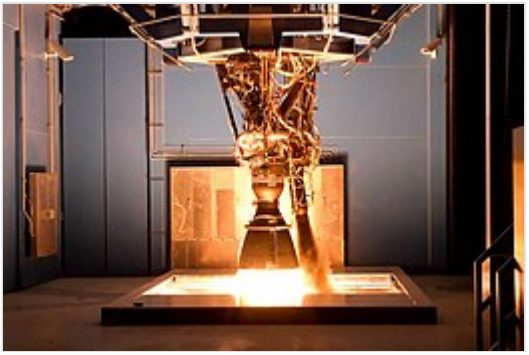
Falcon Heavy is a heavy-lift launch vehicle capable of delivering up to 63,800 kg (140,700 lb) to Low Earth orbit (LEO) or 26,700 kg (58,900 lb) to geosynchronous transfer orbit (GTO). It uses three slightly modified Falcon 9 first-stage cores with a total of 27 Merlin 1D engines.[149][150] The Falcon Heavy successfully flew its inaugural mission on 6 February 2018, launching Musk's personal Tesla Roadster into heliocentric orbit.[151]

Both the Falcon 9 and Falcon Heavy are certified to conduct launches for the National Security Space Launch (NSSL).[152][153] As of 15 February 2025, the Falcon 9 and Falcon Heavy have been launched 452 times, resulting in 449 full mission successes, one partial success, and one in-flight failure. In addition, a Falcon 9 experienced a pre-flight failure before a static fire test in 2016.[154][155]

SpaceX is developing a fully reusable super-heavy lift launch system known as Starship. It comprises a reusable first stage, called Super Heavy, and the reusable Starship second stage space vehicle. As of 2017, the system was intended to supersede the company's existing launch vehicle hardware by the early 2020s.[156][157]

Rocket engines

Since the founding of SpaceX in 2002, the company has developed several rocket engines – Merlin, Kestrel, and Raptor – for use in launch vehicles,[158][159] Draco for the reaction control system of the Dragon series of spacecraft,[160] and SuperDraco for abort capability in Crew Dragon.[161]



Merlin 1D engine undergoes a test at SpaceX's Rocket Development and Test Facility in McGregor, Texas

Merlin is a family of rocket engines that uses liquid oxygen (LOX) and RP-1 propellants. Merlin was first used to power the Falcon 1's first stage and is now used on both stages of the Falcon 9 and Falcon Heavy vehicles.[162] Kestrel uses the same propellants and was used as the Falcon 1 rocket's second-stage main engine.[159][163]

Draco and SuperDraco are hypergolic liquid-propellant rocket engines. Draco engines are used on the reaction control system of the Dragon and Dragon 2 spacecraft.[160] The SuperDraco engine is more powerful, and eight SuperDraco engines provide launch escape capability for crewed Dragon 2 spacecraft during an abort scenario.[164]

Raptor is a new family of liquid oxygen and liquid methane-fueled full-flow staged combustion cycle engines to power the first and second stages of the in-development Starship launch system.[158] Development versions were test-fired in late 2016,[165] and the engine flew for the first time in 2019, powering the *Starhopper* vehicle to an altitude of 20 m (66 ft).[166]

Dragon spacecraft

SpaceX has developed the Dragon spacecraft to transport cargo and crew to the International Space Station (ISS).

SpaceX Dragon 2 spacecraft, designed to deliver crew and cargo to and from the International Space Station (cargo version shown)

The first-generation Dragon 1 spacecraft was used only for cargo operations. It was developed with financial support from NASA under the Commercial Orbital Transportation Services (COTS) program. After a successful COTS demonstration flight in 2010, SpaceX was chosen to receive a Commercial Resupply Services (CRS) contract.[37]

The currently operational second-generation Dragon 2 spacecraft conducted its first flight, without crew, to the ISS in early 2019, followed by a crewed flight of Dragon 2 in 2020.[120] It was

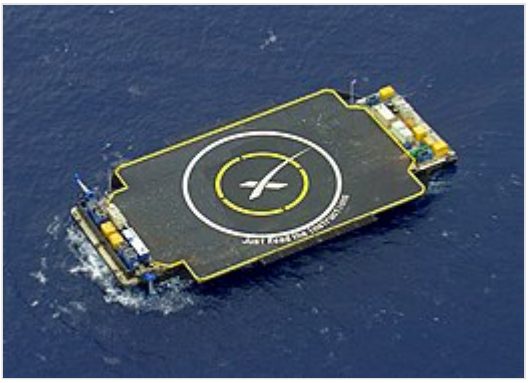
developed with financial support from NASA under the Commercial Crew Program program. The cargo variant of Dragon 2 flew for the first time in December 2020, for a resupply to the ISS as part of the CRS contract with NASA.[167]

In March 2020 SpaceX revealed the Dragon XL, designed as a resupply spacecraft for NASA's planned Lunar Gateway space station under a Gateway Logistics Services (GLS) contract.[168] Dragon XL is planned to launch on the Falcon Heavy, and is able to transport over 5,000 kg (11,000 lb) to the Gateway. Dragon XL will be docked at the Gateway for six to twelve months at a time.[169]

SpaceX designed a spacesuit to be worn inside the Dragon spacecraft to protect from possible depressurization.[170] On 4 May 2024, SpaceX unveiled a second spacesuit designed for extravehicular activity, planned to be used for a spacewalk during the Polaris Dawn mission.[171]

Autonomous spaceport drone ships

SpaceX routinely returns the first stage of Falcon 9 and Falcon Heavy rockets after orbital launches. The rocket lands at a predetermined landing site using only its propulsion systems.[172] When propellant margins do not permit a return to a launch site (RTLS), rockets return to a floating landing platform in the ocean, called autonomous spaceport drone ships (ASDS).[173]



Autonomous spaceport drone ship in position prior to CRS-6 mission

SpaceX also had plans to introduce floating launch platforms, which would be modified oil rigs provide a sea launch option for their Starship launch vehicle. As of February 2023, SpaceX had sold the oil rigs, but had not ruled out sea-based platforms for future use.[174]

Starlink

Starlink is an internet satellite constellation under development by Starlink Services, LLC, a wholly-owned subsidiary of SpaceX,[7][175] that consists of thousands of cross-linked communications satellites in ~550 km orbits. Its goal is to address the significant unmet demand worldwide for low-cost broadband capabilities.[176] Development began in 2015, and initial prototype test-flight satellites were launched on the SpaceX Paz satellite mission in 2017. In May 2019, SpaceX launched the first batch of 60 satellites aboard a Falcon 9.[177] Initial test operation of the constellation began in late 2020[178] and first orders were taken in early 2021.[179] Customers were told to expect internet service speeds of 50 Mbit/s to 150 Mbit/s and latency from 20 ms to 40 ms.[180] In December 2022, Starlink reached over 1 million subscribers worldwide.[181]

Sixty Starlink satellites stacked together before deployment

The planned large number of Starlink satellites has been criticized by astronomers due to concerns over light pollution,[182][183][184] with the brightness of Starlink satellites in both optical and radio wavelengths interfering with scientific observations.[185] In response, SpaceX has implemented several upgrades to Starlink satellites aimed at reducing their brightness.[186] The large number of satellites employed by Starlink also creates long-term dangers of space debris collisions.[187][188] However, the satellites are equipped with krypton-fueled Hall thrusters which allow them to de-orbit at the end of their life. They are also designed to autonomously avoid collisions based on uplinked tracking data.[189]

In December 2022, SpaceX announced Starshield, a program to incorporate military or government entity payloads on board a Starlink-derived satellite bus. The Space Development Agency is a key customer procuring satellites for a space-based missile defense system.[190][191]

In June 2024, SpaceX introduced a compact version of its Starlink antennas, the "Starlink Mini", designed for mobile satellite internet use. Offered for $599 in an early access release, it was more expensive than the base model. The Mini antenna, half the size and one-third the weight of the Standard version, featured a built-in WiFi router, lower power consumption, and over 100 Mbit/s download speeds.[192]

Other projects

Hyperloop

In June 2015, SpaceX announced that it would sponsor a Hyperloop competition, and would build a 1.6 km (0.99 mi) long subscale test track near SpaceX's headquarters for the competitive events.[193][194] The company held the annual competition from 2017 to 2019.[195]

COVID-19 antibody-testing program

In collaboration with doctors and academic researchers, SpaceX invited all employees to participate in the creation of a COVID-19 antibody-testing program in 2020. As such, 4300 employees volunteered to provide blood samples resulting in a peer-reviewed scientific paper crediting eight SpaceX employees as coauthors and suggesting that a certain level of COVID-19 antibodies may provide lasting protection against the virus.[196][197]

Other

In July 2018, Musk arranged for his employees to build a mini-submarine to assist the rescue of children stuck in a flooded cavern in Thailand.[198] Richard Stanton, leader of the international rescue diving team, encouraged Musk to facilitate the construction of the vehicle as a backup in case flooding worsened. However, Stanton later concluded that the mini-submarine would not work and said that Musk's involvement "distracted from the rescue effort".[199][200] Engineers at SpaceX and The Boring Company built the mini-submarine from a Falcon 9 liquid oxygen transfer tube in eight hours and personally delivered it to Thailand.[201][202] Thai authorities ultimately declined to use the submarine, stating that it wasn't practical for the rescue mission.[198]

Facilities

SpaceX is headquartered at the SpaceX Starbase near Brownsville, Texas, where it manufactures and launches its Starship vehicle. However most of the company's operations are based out of its office in Hawthorne, California where it was previously headquartered, where it builds Falcon rockets and Dragon spacecraft, and where it houses its mission control.

The company also operates a Starlink satellite manufacturing facilities in Redmond, Washington, a rocket development and test facility in McGregor, Texas,[203] and maintains an office in the Washington, D.C. area, close to key government customers.[204]

SpaceX has two active launch sites in Florida, one active launch site in California and one active launch site at Starbase in Texas.

Hawthorne, CA: Falcon and Dragon manufacturing, mission control

SpaceX operates a large facility in the Los Angeles suburb of Hawthorne, California. The three-story building, originally built by Northrop Corporation to build Boeing 747 fuselages,[205] houses SpaceX's office space, mission control, and Falcon 9 manufacturing facilities.[206]

SpaceX office in Hawthorne, California at night during a Falcon 9 launch from Vandenberg Space Force Base

The area has one of the largest concentrations of space sector headquarters, facilities, and subsidiaries in the U.S., including Boeing/McDonnell Douglas main satellite building campuses, The Aerospace Corporation, Raytheon, NASA's Jet Propulsion Laboratory, United States Space Force's Space Systems Command at Los Angeles Air Force Base, Lockheed Martin, BAE Systems, Northrop Grumman, and AECOM, etc., with a large pool of aerospace engineers and recent college engineering graduates.[205]

SpaceX uses a high degree of vertical integration in the production of its rockets and rocket engines.[17] SpaceX builds its rocket engines, rocket stages, spacecraft, principal avionics and all software in-house in their Hawthorne facility, which is unusual for the space industry.[17]

The Hawthorne facility was SpaceX's headquarters until August 2024. However, the move to relocate SpaceX's headquarters was seen as largely symbolic, at least in the short term, as the facility will remain to the company's operations.[207]

Boca Chica, TX: Starship manufacturing, launch

SpaceX manufactures and flies Starship test vehicles from the SpaceX Starbase in Boca Chica near Brownsville, Texas, having announced first plans for the launch facility in August 2014.[208][209] The Federal Aviation Administration (FAA) issued the permit in July 2014.[210] SpaceX broke ground on the new launch facility in 2014 with construction ramping up in the latter half of 2015,[211] with the first suborbital launches from the facility in 2019[206] and orbital launches starting in 2023.

SpaceX has faced increased scrutiny over the environmental impact of its Starbase facility.[212][213][214] In August 2024, the Texas Commission on Environmental Quality cited SpaceX for violating environmental regulations by repeatedly releasing pollutants into water near the Boca Chica launch site.[215] The EPA fined SpaceX approximately $150,000 for allegedly discharging "industrial wastewater" and violating the Clean Water Act.[216]

The Starship assembly building at SpaceX Starbase in Texas

McGregor, TX: Rocket Development and Test Facility

SpaceX's Rocket Development and Test Facility in McGregor, Texas is a rocket engine test facility. Every rocket engine and thruster manufactured by SpaceX must pass through McGregor for final testing being used on flight missions.[217][218] The facility also serves as a testing ground for various components and engines during the research and development process.[219] In addition to engine testing, after splashdown and recovery, Dragon spacecraft make a stop at McGregor to have their hazardous hypergolic propellant fuels removed, before the capsules continue on to Hawthorne for refurbishment.[217]

Aerial view of the SpaceX McGregor engine testing facility, 2008

SpaceX calls the facility the most advanced and active rocket engine test facility in the world, and said that as of 2024, over 7,000 tests had been conducted at the facility since it opened, with seven engine test fires on a typical day, across more than a dozen test stands.[220] Despite its low-profile compared to the company's other facilities, is a critical part of SpaceX's operations, and company president and COO Gwynne Shotwell maintains her primary office in McGregor.[221][217]

Originally the site of the Bluebonnet Ordnance Plant during World War II,[219] the facility was later used by Beal Aerospace before being leased by SpaceX in 2003.[222] The company has since expanded it significantly from 256 acres (104 ha) in 2003[219] to 4,000 acres (1,600 ha) by 2015.[220] In July 2021, SpaceX announced plans to build a second production facility for Raptor engines at McGregor. This expansion is expected to significantly increase SpaceX's production capacity, with the goal of producing 800 to 1,000 Raptor engines per year.[223][224]

Starlink manufacturing facilities

SpaceX's Starlink subsidiary operates over two main facilities. Satellite manufacturing takes place near Seattle, Washington while user terminal manufacturing takes place near Austin, Texas.

Starlink's satellite development and manufacturing operations campus occupies over 314,000 square feet (29,200 m^2) in at least six buildings located in Redmond, Washington, east of Seattle. The first building opened in early 2015,[225] and the company later expanded into five buildings on the Redmond Ridge Corporate Center.[226][227]

Starlink opened a user terminal manufacturing facility in Bastrop, Texas, east of Austin in December 2023. In its first nine months of operation, the one-million-square-foot (93,000 m^2) facility produced one million user terminals and was on track to become the largest factory for printed circuit boards in the United States.[228]

Starlink user terminal on the sidewalk of a residential home.

Launch facilities

SpaceX operates four orbital launch sites, at Cape Canaveral Space Force Station and Kennedy Space Center in Florida and Vandenberg Space Force Base in California for Falcon rockets, and Starbase near Brownsville, Texas for Starship. SpaceX has indicated that they see a niche for each of the four orbital facilities and that they have sufficient launch business to fill each pad.[229] The Vandenberg launch site enables highly inclined orbits (66–145°), while Cape Canaveral and Kennedy enable orbits of medium inclination (28.5–55°).[230] Larger inclinations, including SSO, are possible from Florida by overflying Cuba.[231]

Before it was retired, all Falcon 1 launches took place at the Ronald Reagan Ballistic Missile Defense Test Site on Omelek Island of the Marshall Islands.[232]

Falcon Heavy Side Boosters landing on LZ1 and LZ2 at Cape Canaveral

In April 2007, the Pentagon approved the use of Cape Canaveral Space Launch Complex 40 (SLC-40) by SpaceX.[233] The site has been used since 2010 for Falcon 9 launches, mainly to low Earth and geostationary orbits. The former Launch Complex 13 at Cape Canaveral, now renamed Landing Zones 1 and 2, has since 2015 been used for Falcon 9 first-stage booster landings.[234]

Vandenberg Space Launch Complex 4 (SLC-4E) was leased from the military in 2011 and is used for payloads to polar orbits. The Vandenberg site can launch both Falcon 9 and Falcon Heavy vehicles,[235] but cannot launch to low inclination orbits. The neighboring SLC-4W was converted to Landing Zone 4 in 2015 for booster landings.[236]

SpaceX west coast launch facility at Vandenberg Space Force Base, during the launch of CASSIOPE

On 14 April 2014, SpaceX signed a 20-year lease for Kennedy Space Center Launch Complex 39A.[237] The pad was subsequently modified to support Falcon 9 and Falcon Heavy launches. As of 2024 it is the only pad that supports Falcon Heavy launches. SpaceX launched its first crewed mission to the ISS from Launch Pad 39A on 30 May 2020.[238] Pad 39A has been prepared since 2019 to eventually accommodate Starship launches. With delays in launch FAA permits for Boca Chica, Texas, the 39A Starship preparation was accelerated in 2022.[239]

Contracts

SpaceX won demonstration and actual supply contracts from NASA for the International Space Station (ISS) with technology the company developed. SpaceX is also certified for U.S. military launches of Evolved Expendable Launch Vehicle-class (EELV) payloads. With approximately thirty missions on the manifest for 2018 alone, SpaceX represented over $12 billion under contract.[68]

Cargo to ISS

In 2006, SpaceX won a NASA Commercial Orbital Transportation Services (COTS) Phase 1 contract to demonstrate cargo delivery to the ISS, with a possible contract option for crew transport.[240] Through this contract, designed by NASA to provide "seed money" through Space Act Agreements for developing new capabilities, NASA paid SpaceX $396 million to develop the cargo configuration of the Dragon spacecraft, while SpaceX developed the Falcon 9 launch vehicle with their resources.[241] These Space Act Agreements have been shown to have saved NASA millions of dollars in development costs, making rocket development 4–10 times less expensive than if produced by NASA alone.[242]

The COTS 2 Dragon is berthed to the International Space Station (ISS) by Canadarm2

In December 2010, with the launch of the SpaceX COTS Demo Flight 1 mission, SpaceX became the first private company to successfully launch, orbit, and recover a spacecraft.[243] Dragon successfully berthed with the ISS during SpaceX COTS Demo Flight 2 in May 2012, a first for a private spacecraft.[244]

Commercial Resupply Services (CRS) is a series of contracts awarded by NASA from 2008 to 2016 for the delivery of cargo and supplies to the ISS on commercially operated spacecraft. The first CRS contracts were signed in 2008 and awarded $1.6 billion to SpaceX for 12 cargo transport missions, covering deliveries to 2016.[245] SpaceX CRS-1, the first of the 12 planned resupply missions, launched in October 2012, achieved orbit, berthed, and remained on station for 20 days, before re-entering the atmosphere and splashing down in the Pacific Ocean.[246]

CRS missions have flown approximately twice a year to the ISS since then. In 2015, NASA extended the Phase 1 contracts by ordering an additional three resupply flights from SpaceX, and then extended the contract further for a total of twenty cargo missions to the ISS.[247][245][248] The final Dragon 1 mission, SpaceX CRS-20, departed the ISS in April 2020, and Dragon was subsequently retired from service. A second phase of contracts was awarded in January 2016 with SpaceX as one of the awardees. SpaceX will fly up to nine additional CRS flights with the upgraded Dragon 2 spacecraft.[249][250] In March 2020, NASA contracted SpaceX to develop the Dragon XL spacecraft to send supplies to the Lunar Gateway space station. Dragon XL will be launched on a Falcon Heavy.[251]

Crewed

SpaceX is responsible for the transportation of NASA astronauts to and from the ISS. The NASA contracts started as part of the Commercial Crew Development (CCDev) program, aimed at developing commercially operated spacecraft capable of delivering astronauts to the ISS. The first contract was awarded to SpaceX in 2011,[252][253] followed by another in 2012 to continue development and testing of its Dragon 2 spacecraft.[254]

NASA astronauts inside the Dragon spacecraft during the Crew-1 mission rendezvous with the International Space Station

In September 2014, NASA chose SpaceX and Boeing as the two companies that would be funded to develop systems to transport U.S. crews to and from the ISS.[255] SpaceX won $2.6 billion to complete and certify Dragon 2 by 2017. The contracts called for at least one crewed flight test with at least one NASA astronaut aboard. Once Crew Dragon received NASA human-spaceflight certification, the contract required SpaceX to conduct at least two, and as many as six, crewed missions to the space station.[255]

SpaceX completed the first key flight test of its Crew Dragon spacecraft, a Pad Abort Test, in May 2015,[256] and successfully conducted a full uncrewed test flight in early 2019. The capsule docked to the ISS and then splashed down in the Atlantic Ocean.[257] In January 2020, SpaceX conducted an in-flight abort test, the last test flight before flying crew, in which the Dragon spacecraft fired its launch escape engines in a simulated abort scenario.[258]

On 30 May 2020, the Crew Dragon Demo-2 mission was launched to the International Space Station with NASA astronauts Bob Behnken and Doug Hurley, the first time a crewed vehicle had launched from the U.S. since 2011, and the first SpaceX commercial crewed launch to the ISS.[259] The Crew-1 mission was successfully launched to the International Space Station on 16 November 2020, with NASA astronauts Michael Hopkins, Victor Glover and Shannon Walker along with JAXA astronaut Soichi Noguchi,[260] all members of the Expedition 64 crew.[261] On 23 April 2021, Crew-2 was launched to the International Space Station with NASA astronauts Shane Kimbrough and K. Megan McArthur, JAXA astronaut Akihiko Hoshide, and ESA astronaut Thomas Pesquet.[262] The Crew-2 mission successfully docked on 24 April 2021.[263]

SpaceX also offers paid crewed spaceflights for private individuals. The first of these missions, Inspiration4, launched in 2021 on behalf of Shift4 Payments CEO Jared Isaacman. The mission launched the Crew Dragon *Resilience* from the Florida Kennedy Space Center's Launch Complex 39A atop a Falcon 9 launch vehicle, placed the Dragon capsule into low Earth orbit, and ended successfully about three days later when the *Resilience* splashed down in the Atlantic Ocean. All four crew members received commercial astronaut training from SpaceX. The training included lessons in orbital mechanics, operating in a microgravity environment, stress testing, emergency-preparedness training, and mission simulations.[264]

Resilience after splashdown

National defense

Launch of the STP-2 mission on a Falcon Heavy in June 2019

In 2005, SpaceX announced that it had been awarded an Indefinite Delivery/Indefinite Quantity (IDIQ) contract, allowing the United States Air Force to purchase up to $100 million worth of launches from the company.[265] Three years later, NASA announced that it had awarded an IDIQ Launch Services contract to SpaceX for up to $1 billion, depending on the number of missions awarded.[266] In December 2012, SpaceX announced its first two launch contracts with the United States Department of Defense (DoD). The United States Air Force Space and Missile Systems Center awarded SpaceX two EELV-class missions: Deep Space Climate Observatory (DSCOVR) and Space Test Program 2 (STP-2). DSCOVR was launched on a Falcon 9 launch vehicle in 2015, while STP-2 was launched on a Falcon Heavy on 25 June 2019.[267]

The Falcon 9 v1.1 was certified for National Security Space Launch (NSSL) in 2015, allowing SpaceX to contract launch services to the Air Force for any payloads classified under national security.[152] This broke the monopoly held since 2006 by United Launch Alliance (ULA) over U.S. Air Force launches of classified payloads.[268] In April 2016, the U.S. Air Force awarded the first such national security launch to SpaceX to launch the second GPS III satellite for $82.7 million.[269] This was approximately 40% less than the estimated cost for similar previous missions.[270] SpaceX also launched the third GPS III launch on 20 June 2020.[271] In March 2018, SpaceX secured an additional $290 million contract from the U.S. Air Force to launch another three GPS III satellites.[272]

The U.S. National Reconnaissance Office (NRO) also purchased launches from SpaceX, with the first taking place on 1 May 2017.[273] In February 2019, SpaceX secured a $297 million contract from the U.S. Air Force to launch another three national security missions, all slated to launch no earlier than FY 2021.[274] In August 2020, the U.S. Space Force awarded its National Security Space Launch (NSSL) contracts for the following 5–7 years. SpaceX won a contract for $316 million for one launch. In addition, SpaceX will handle 40% of the U.S. military's satellite launch requirements over the period.[275]

SpaceX also designs and launches custom military satellites for the Space Development Agency as part of a new missile defense system in low Earth orbit.[276] The constellation would give the United States capabilities to sense, target and potentially intercept nuclear missiles and hypersonic weapons launched from anywhere on Earth.[277] Both China and Russia brought concerns to the United Nations about the program,[278] and various organizations warn it could be destabilizing and trigger an arms race in space.[279][280]

In March 2024, Reuters reported that, as part of a $1.8 billion contract signed with the National Reconnaissance Office in 2021, SpaceX is building a network of hundreds of spy satellites. This new network, Reuters reported, would be able to operate as a swarm in low orbits.[281]

In December 2024, WSJ reported that Musk didn't have access to government secrets.[282]

Launch market competition and pricing pressure

SpaceX's low launch prices, especially for communications satellites flying to geostationary transfer orbit (GTO), have resulted in market pressure on its competitors to lower their own prices.[17] Prior to 2013, the openly competed comsat launch market had been dominated by Arianespace (flying the Ariane 5) and International Launch Services (flying the Proton).[283] With a published price of $56.5 million per launch to low Earth orbit, Falcon 9 rockets were the least expensive in the industry.[284] European satellite operators are pushing the ESA to reduce launch prices of the Ariane 5 and Ariane 6 rockets as a result of competition from SpaceX.[285]

SpaceX ended the United Launch Alliance (ULA) monopoly of U.S. military payloads when it began to compete for national security launches. In 2015, anticipating a slump in domestic, military, and spy launches, ULA stated that it would go out of business unless it won commercial satellite launch orders.[286] To that end, ULA announced a major restructuring of processes and workforce to decrease launch costs by half.[287][288]

Congressional testimony by SpaceX in 2017 suggested that the NASA Space Act Agreement process of "setting only a high-level requirement for cargo transport to the space station [while] leaving the details to industry" had allowed SpaceX to design and develop the Falcon 9 rocket on its own at a substantially lower cost. According to NASA's own independently verified numbers, SpaceX's total development cost for the Falcon 9 rocket, including the Falcon 1 rocket, was estimated at $390 million. In 2011, NASA estimated that it would have cost the agency about $4 billion to develop a rocket like the Falcon 9 booster based upon NASA's traditional contracting processes, about ten times more.[242] In May 2020, NASA administrator Jim Bridenstine remarked that thanks to NASA's investments into SpaceX, the United States has 70% of the commercial launch market, a major improvement since 2012 when there were no commercial launches from the country.[289]

As of 2024, SpaceX operates a Rideshare and Bandwagon (mid inclination) programs. This provides additional competition for small satellite launchers.[290]

Corporate affairs

Business trends

Year	Revenue (billion USD)	Valuation (billion USD)	Number of employees
2002			ca. 30[291]
2003			
2004			
2005			ca. 90 (Feb.)[292] ca. 160 (Nov.)[293]
2006			
2007			ca. 350 (Aug.)[294]
2008			ca. 600 (Dec.)[295]
2009			> 800 (Dec.)[296]
2010			> 1,000 (June)[297]
2011			ca. 1,300 (Jan.)[298]
2012		2.4 (June)[299]	ca. 1,800 (May)[300]
2013			ca. 3,800 (Oct.)[301]
2014		10 (Aug.)[302]	
2015		12 (Jan.)[303]	
2016		15 (Nov.)[304]	ca. 5,000 (Nov.)[305]
2017		21 (Nov.)[306]	ca. 7,000 (Nov.)[307]
2018		27 (Apr.)[308]	
2019		33 (May)[309]	> 6,000 (July)[310]
2020	1.8[311]	36 (May)[312]	
2021	2.3[311]	74 (Feb.)[313] 100 (Oct.)[313]	> 9,500 (March)[314]
2022	4.6[315]	127 (Aug.)[316]	ca. 12,000 (April)[317]
2023	ca. 9[318]	137 (Jan.)[319] 180 (Dec.)[320]	> 13,000 (Sept.)[321]
2024	ca. 15[318] (Forecast)	350 (Nov.)[322]	

Board of directors

SpaceX board of directors as of January 2021[323]

Joined board	Name	Titles
2002[324]	Elon Musk	Founder, chairman, CEO and CTO of SpaceX; CEO, Product Architect, and former chairman of Tesla; former chairman of SolarCity[324]
2002[325]	Kimbal Musk	Board member, Tesla[326]
2009[327]	Gwynne Shotwell	President and COO of SpaceX[328]
	Luke Nosek	Co-founder, PayPal[329]
	Steve Jurvetson	Co-founder, Future Ventures fund[330]
2010[331]	Antonio Gracias	CEO and Chairman of the Investment Committee at Valor Equity Partners[332]
2015[333]	Donald Harrison	President of global partnerships and corporate development, Google[334]

Leadership changes

In November 2022, the company announced COO Gwynne Shotwell and vice president Mark Juncosa would oversee Starbase, its Texas launch facility, along with Omead Afshar, who at the time oversaw operations for Tesla in Texas. Shyamal Patel, who was senior director of operations at the site, would shift to its Cape Canaveral site. *CNBC* reported that these executive moves demonstrated "the sense of urgency within the company to get Starship flying".[335][336][337]

Workplace culture

According to former NASA deputy administrator Lori Garver, the company overall has a male-dominated employee culture, similar to that of the spaceflight industry in general.[338] In December 2021, claims of workplace sexual harassment from five former SpaceX employees, ranging from interns to full engineers, were published.[339] The former employees claimed to have experienced unwanted advances and uncomfortable interactions.[340] Additionally, the accounts included claims of a culture of sexual harassment existing at the company and one where complaints made to executives, managers, and human resources officers went largely unaddressed.[341]

In May 2022, a Business Insider article alleged that Musk engaged in sexual misconduct with a SpaceX flight attendant in a private jet in 2016 citing an anonymous friend of the flight attendant.[342] In response, some employees collaborated on an open letter condemning "Elon's harmful Twitter behavior".[343] It also asks the company to clearly define SpaceX's "no-asshole" and "zero tolerance" policies, which it says is unequally enforced from one employee to the next. The next day, Gwynne Shotwell announced that those employees who were involved with the letter had been terminated and claimed that unsponsored, unsolicited surveys were sent to employees during the work day and that some felt pressured to sign the letter.[344]

The company has also been described as having a work culture that pushes employees to work excessively and is described as fostering a burnout culture.[345] According to a memo by Blue Origin, a rival aerospace company with a history of lawsuits and anti-SpaceX political lobbying,[346][347][348] SpaceX expected very long work hours, work on weekends, and limited use of holidays.[345]

In June 2024, eight ex-employees, the same who had previously been fired for penning the open letter against Elon Musk, filed a lawsuit against Musk and SpaceX alleging sexual harassment and discrimination.[349][350]

In December 2024, federal agencies investigated SpaceX for security violations as well as Musk's alleged drug use.[351][352]

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